REMARKS

This Amendment is responsive to the Office Action mailed March 29, 2004. Claims 1-15 were pending and the Office Action rejected all claims. Specifically, Claim 1-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,166,767 (Watanabe) in view of WO 99/53683 (Kozlowski).

In response, the Applicant has amended independent Claims 1, 8, 9 and 10 and added dependent Claim 16 to more particularly point out the distinctions of the present invention over the circuit disclosed in Watanabe. Specifically, the claims now highlight the feedback amplifier formed by the pixel circuitry (M3 and M1) and the column buffer 200 (the operation of which is discussed on page 9 of the specification). Neither Watanabe nor Kozlowski disclose such a construction. Furthermore, the combination of Watanable and Kozlowski, without the benefit of the present disclosure, would not have been obvious to one of skill in the art, since the proposed combination would not work (i.e. there specifically would be no motivation to combine these references as argued by the Office Action to form an inoperable circuit as discussed below).

As understood by the Applicant, Watanabe discloses reducing fixed pattern noise by facilitating concurrent access to the signal level from the current video frame and the reset level of the next video frame to perform double sampling. Fixed pattern noise is thus subtracted even as random noise is increased via quadrature addition of uncorrelated data. More particularly, Watanabe discloses an imaging sensor architecture that simultaneously amplifies the pixel signal and subtracts two uncorrelated voltage levels, the first corresponding to a composite signal plus reset level from one frame and the second to a new reset value for the next frame, to globally reduce fixed pattern noise (Col 1 lines 8-10; col 5 lines 10-15 and col 7 lines 20-24). However, subtracting uncorrelated signals increases random noise and decreases dynamic range by quadrature addition of random noise including reset noise. Watanabe terms the subtraction process as "Correlated Double Sampling" (col 2 line 46), but notes that the second reset signal V_{res} corresponds to the level after the pixel has been discharged; the subtraction process hence could be more appropriately described "Uncorrelated Double Sampling" to reflect the true purpose of eliminating fixed noise.

Watanabe shows in Fig. 6 a four transistor pixel with photodiode 101 indirectly driving transistor 103 through access transistor 102. Watanabe includes a fourth transistor 104 for pixel access.

Kozlowski discloses in WO '683 a three transistor pixel with photodiode 12 directly driving transistor 14. Pixel access transistor 14 is asserted to process pixel data. The '683 reference further shows resetting the 3-transistor pixel using spatially distributed amplification including the pixel's transistors to suppress random noise generated by photodiode 12 via tapered reset operation to successively create a feedback path between the photodiode capacitance and feedback amplifier output terminal 20.

In contrast to the cited prior art references, the present invention, as illustrated in Figs. 3 through 6, discloses a new three transistor pixel with photodiode 12 driving transistor M1 through access transistor M2. The photodiode is not directly coupled to M2 and a pixel access transistor is eliminated relative to both Watanabe and Kozlowski.

Resetting transistor 102 of Watanabe with a tapered reset signal in view of Kozlowski interferes with the key purpose of Watanabe to minimize fixed pattern noise by storing the fixed pattern offsets across capacitor 149. On the other hand, one of ordinary skill in the art would appreciate that removing capacitor 149 is necessary to implement the distributed feedback amplification required to facilitate tapered reset as taught in both the 3 transistor design of WO 99/53683 and the four-transistor design of US 6,697,111. Simply impressing a tapered reset waveform on reset transistor 105 of Fig. 6, transistor 111 of Fig. 7 or transistor 122 of Fig. 8 hence cannot suppress reset noise in any of Watanabe's embodiments. Watanabe specifically teaches that fixed pattern noise minimization is most important relative to all other noise sources. Removing capacitor 149 wholly disables the fixed pattern noise suppression means and embodiments taught by Watanabe. Including the capacitor enables fixed pattern noise suppression but wholly prevents using Watanabe in view of Kozlowski.

Other impediments to combining Watanabe and Kozlowski follow to those of ordinary skill in the art. The purported prime focus of the device disclosed in Watanabe is to suppress fixed pattern noise. One major impediment is consequently the presence of an amplification section 132 between the bus line 140 and photoconversion section 131. Watanabe's amplification sections of Figs 6-9 broadly interfere with the formation of the necessary feedback

path between the photodiode capacitance and the output node of a feedback amplifier. The photodiode reset noise suppression taught by the tapered reset of Kozlowski is hence impractical even if Kozlowski is used to suppress the reset noise of the sense capacitance.

Thus, the proposed combination is NOT obvious to one of skill in art, and the proposed combination could be viewed as teaching away from the present invention, since the proposed combination would not be operable to achieve the desired function (noise reduction). The Office Action has failed to adequately provide support for the proposition that the two references could be combined, as argued in the rejection. In addition, while the Office Action has picked certain components from Watanabe, the Office Action has failed to address how or why one of skill in the art would know which components to eliminate in the circuit of Watanabe. The only way to do so, would be to use the present disclosure as a blueprint, which is impermissible.

In addition, since the proposed combination of Watanable and Kozlowski fails to teach or suggest the "feedback amplifier" of the present invention, as claimed in the amended claims, the present invention is patentable over the cited art of record.

The Commissioner is hereby authorized to charge any fees (or credit any overpayment) associated with this communication and which may be required under 37 CFR §1.78 to Deposit Account No. 50-2603, **referencing Attorney Docket No. 354096.00500**. **A duplicate sheet is attached**.

Respectfully submitted,
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